

Differential Equations

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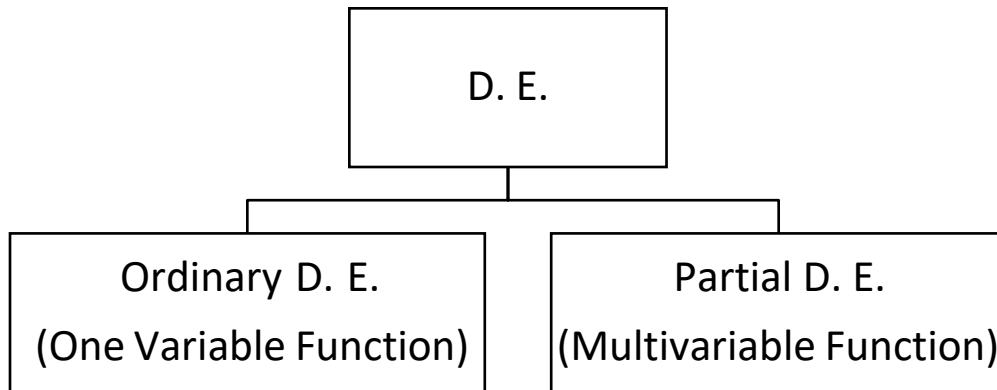
Introduction

The primary purpose of the differential equation is the study of solutions that satisfy the equations, and the properties of the solutions. Learn how to solve differential equation, one of the easiest ways to solve the differential equation is by using explicit formulas. discuss the definition, types, methods to solve the differential equation, order and degree of the differential equation.

The mathematical formulations of problems in chemistry, physics, engineering, economics, biology, and other sciences are usually embodied in differential equations. The analysis of the resulting equations then provides new insight into the original problems.

Differential Equation (D.E.)

Differential Equation is an equation involving a function and its derivatives. It can be referred to as an ordinary differential equation (ODE) or a partial differential equation (PDE) depending on whether or not partial derivatives are involved.



For examples:

1. $\frac{dy}{dx} + y = 1$ (Ordinary D.E.)
2. $y' - y = \sin x$ (Ordinary D.E.)
3. $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$ (Ordinary D.E.)
4. $\frac{\partial y}{\partial x} + \frac{\partial y}{\partial z} = 1$ (Partial D.E.)

Order of D. E.

The Order of a D. E. is the highest order derivatives occurring.

Degree of D. E.

The Degree of a D. E. is the power of the highest order

For examples:

1. $\frac{dy}{dx} + y = 1$ (Order=1 , Degree=1)
2. $(y')^2 - y^2 = \cos(x)$ (Order=1 , Degree=2)
3. $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$ (Order=2 , Degree=1)

Solution of D. E.

A Solution of D. E. consist of a function defined and n-times differential having the property satisfying the D. E.

Examples

1) Is $y = 2\sqrt{x}$ a solution of the following D. E.
$$y \frac{dy}{dx} = 2$$

2) Is $y = \sin(t)$ a solution of the following D. E.
$$\left(\frac{dy}{dt}\right)^2 + y^2 = 1$$

3) Is $y = 4x^2 + 12$ a solution of the following D. E.
$$y - \frac{dy}{dx} - 8 = 4(x - 1)^2$$